

3. On the Existence of Rudimentary Antlers in the Okapi.
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tory).

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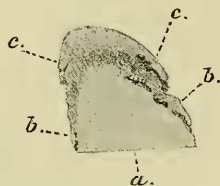
(Plates VI. & VII.* and Text-figures 49-55.)

We know a great deal more as to the horns of the Okapi than was the case when I communicated my description of that animal to the Society in 1901, and founded the genus *Okapia*.

The two skulls sent home by Sir Harry Johnston—the first seen in Europe—were hornless, and it was at first a matter of doubt as to whether the Okapi was a hornless Giraffid, or whether the male possessed horns whilst these two skulls were the one immature and the other that of a hornless female.

During the printing of my memoir additional specimens were received in Brussels, and were transmitted to Dr. Forsyth Major in London for study and description. I saw in Dr. Forsyth Major's possession a fine adult Okapi skull which had a pair of well-developed bony cones rising each by a broad base from the frontals, of which they appeared to form part. No suture was visible. An outline of this skull was published in my memoir by kind permission of Dr. Forsyth Major. I also was able to examine and to mention the existence of a curious structure discovered by that gentleman in regard to these ossicuspis; and I described it in the following terms:—"The fine bony cones three inches long, which have made their appearance in the

Text-fig. 49.



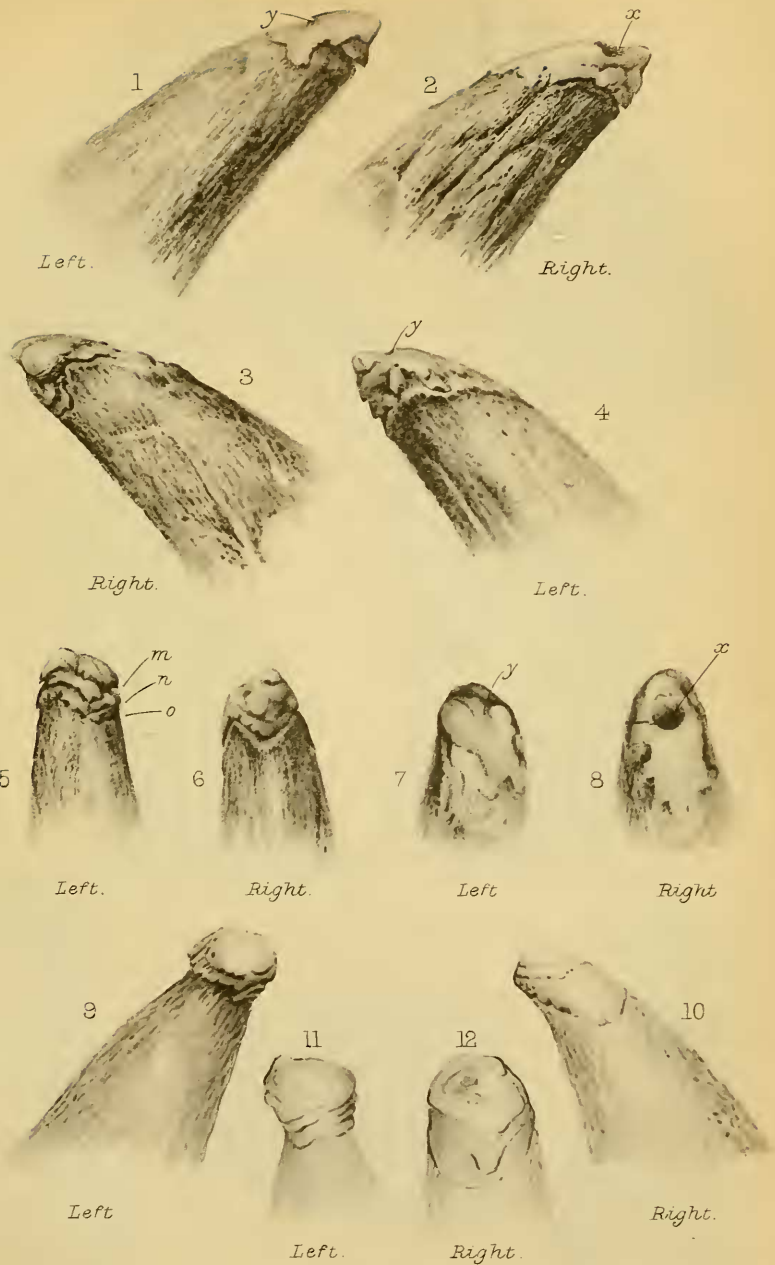
Drawing of a fore and aft section through the tip of the ossicone of an adult Okapi in the collection of the Museum of the Congo Independent State. The section and drawing were made by Dr. Forsyth Major.

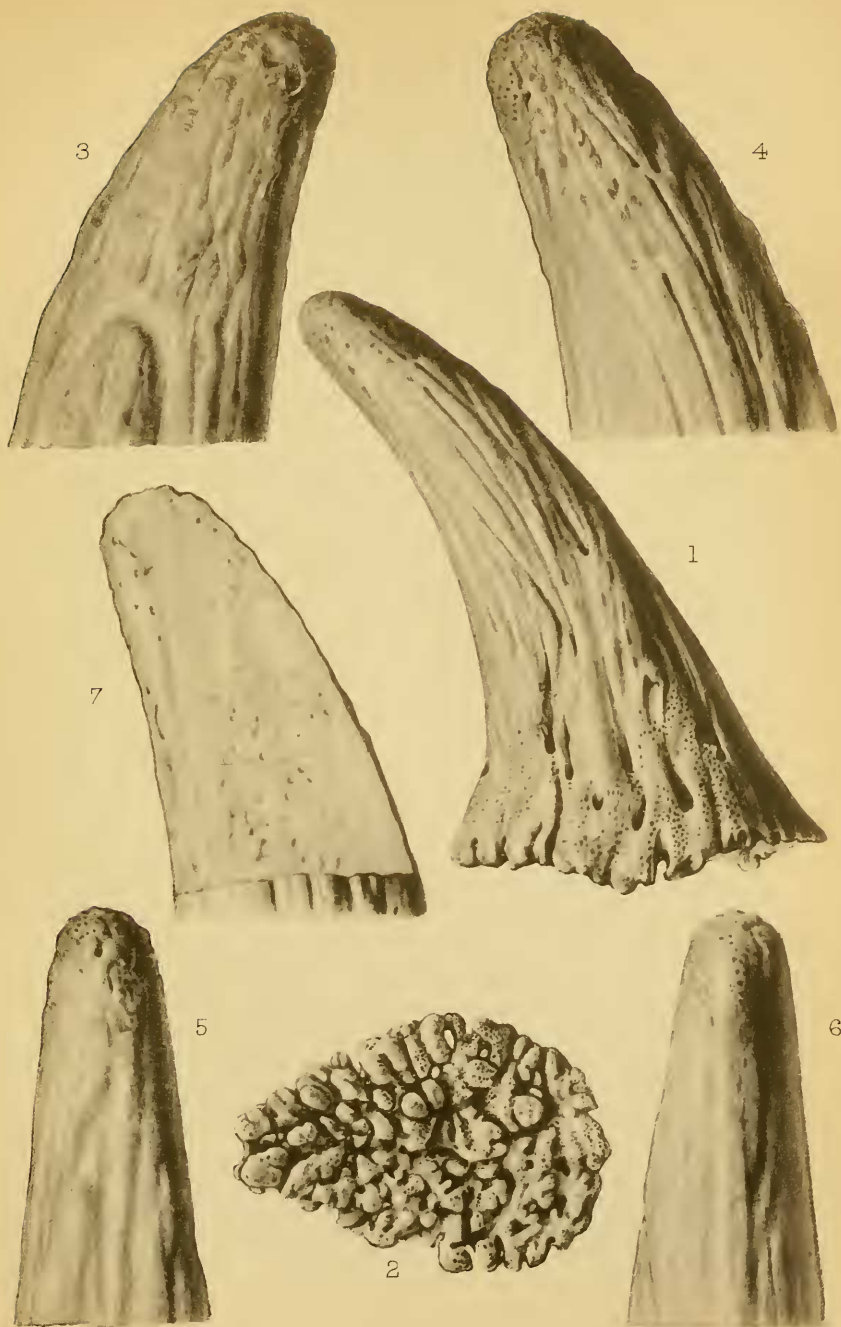
The section shows the penetration of transverse fissures from the surface into the interior of the horn-tip.

a, dense ivory-like bone; *b*, posteriorly-placed transverse fissure; *c*, more anterior transverse fissure (marking off and presumably about to cut off and detach an anterior segment or plate of bone as a rudimentary "antler")

Brussels skull, show no suture at their base, nor any indication of origin as separate cap-like structures. For all that one can see they may be direct outgrowths of the frontal bone itself. Curiously

* For explanation of the Plates, see p. 134.





enough, the point and posterior margin of the bony cone are polished as though it had protruded through the skin like a cervine antler. The point is separated by a suture from the rest of the 'ossicone,' forming a small terminal cap of bone a third of an inch in depth. This curious structure, as well as a possible second suture a little lower down the ossicone, was pointed out to me by Dr. Forsyth Major. These appearances will be figured in that gentleman's memoir on the Brussels' specimens." This is the first and so far the only published notice of the antler-like tips of the Okapi's horns. The figure prepared by Dr. Major of the section made by him through the end of this Okapi's ossicone is reproduced in the text-figure here appended (text-fig. 49). Dr. Major does not himself propose to publish anything further at present on the Okapi, and the little drawing has been placed in my hands by him. A tracing of it was also kindly sent to me by M. Fraipont, of Liège.

The further history of our knowledge of the horns of the Okapi has been complicated by the arrival in Europe of various specimens, concerning the sex of which either erroneous information or none at all has been given by the natives from whom the specimens were obtained. Thus Dr. Forsyth Major was led to suppose that the female Okapi has a small unattached ossicone, some two inches in length, when adult, but he subsequently came to the conclusion that this supposed female was in reality a young male. In 'La Belgique Coloniale,' No. 21, May 1902, Dr. Forsyth Major wrote:—"L'Okapi possède deux cornes frontales, reconvertes d'une peau velue, plus petites, de forme conique et presque verticales chez la femelle; plus grandes, dirigées obliquement en arrière et en peu triangulaires chez le mâle."

At a subsequent date Dr. Forsyth Major came to the conclusion that the specimen supposed to be a female possessing small ossicones, was in reality a young male (Proc. Zool. Soc. N. S. 339), and that the female Okapi is hornless, whilst the male possesses "horns" which make their appearance as conical structures, ossifying independently of the subnasal bone (as in the Giraffe) and becoming firmly ankylosed to the frontal bone in the adult—a boss-like upgrowth of which forms the structure of the complete horn. There is a little room for doubt that this is the true account of the matter, though we still are in want of full information as to the characters of the adult female Okapi*. In a subsequent publication I shall be able to give more precisely the characters of the two types of skull, supposed to be that of the horn-bearing and the hornless female, respectively. The skulls carrying the ossicones are supposed to be of the horn-bearing female, and the skulls carrying the small knob-like protuberance of the integument, separable from the subjacent bone and representing the horn of the male.

* The uncertainty which exists as to the origin of skin and skull which was sent home from Africa as belonging to one individual, whereas they in certain cases belong to distinct individuals, it is still doubtful as to whether the female Okapi has or has not in the adult condition a small knob-like protuberance of the integument, separable from the subjacent bone and representing the horn of the male.

(supposed to be those of males) are longer and narrower than the equally large or larger skulls devoid of any bony cones in connection with the frontals (supposed to be those of females)*. Whatever opinion is held, or whatever decision may be ultimately arrived at in regard to these two types of skull, it is the fact that they are very distinct from one another and that all the Okapi skulls which I have examined can be definitely assigned to one or the

Text-fig. 50.



Rudimentary free ossicone of hemispherical shape from the skin overlying the frontal bossed region of the skull of an Okapi of the broad-skulled type—sub-adult (deciduous molars very much worn, premolars not yet visible; third lower molar in use on both sides, fifth cusp shows slight wear).

a, natural size; *b*, enlarged.

Text-fig. 51.



Section of the ossicone drawn in text-fig. 50, to show the incomplete ossification.

other of these two types. There is no third form known. The two types may perhaps be best distinguished as *O. johnstoni* (the name I gave to the broad hornless sub-adult skull accompanying

* One of these broad-skulled specimens has, however, been found to possess a pair of completely detached bony ossicones of minute size embedded in the integument. The specimen is a little older (as indicated by the dentition) than Sir Harry Johnston's larger individual (that mounted in the British Museum), but is not quite adult. It belongs to Messrs. Rowland Ward. I give here figures of the minute ossicone (text-figs. 50 & 51).

the skin sent home by Sir Harry Johnston) and *O. liebrechtsi*, the name given by Dr. Forsyth Major to the more elongate and narrow type of skull, which is that usually provided with bony cones attached to or ankylosed with the frontal bones. It is important to note that Dr. Major figures a skull (Proc. Zool. Soc. loc. cit. p. 423) which is hornless and is regarded by him as that of a female of the elongate type, *O. liebrechtsi*. I hope shortly to publish some measurements and outlines of these two types of skull. I have examined three of the *O. johnstoni*-type, and five of the *O. liebrechtsi*-type. Though there is considerable variation in the number and breadth of the white stripes on the fore and hind limbs of the skins of Okapi received in this country (including the excellent specimens obtained independently by Major Powell Cotton and by Captain Boyd Alexander from widely separated localities, the former from the Ituri Forest, the latter from the Welle River), I have seen no evidence that a different striping of the skin is associated with the difference of skull-form. On the contrary, there is positive evidence that the striping of the skin is very nearly identical (though no two specimens are exactly alike) in animals which possessed the *liebrechtsi* form of skull with that exhibited by the mounted specimen (*O. johnstoni*) with hornless skull, sent home by Sir Harry Johnston, figured by me, and now in the British Museum. Nevertheless, it is true that direct and convincing evidence is as yet wanting for the conclusion that *O. liebrechtsi* is merely the male of *O. johnstoni*.

When I had an opportunity (in 1904) of examining the fine skin of the adult (supposed) male Okapi, presented by the Congo State to the Museum of Paris, which is set up in the public gallery there, I was especially anxious to note the state of the horn-tips. I found that they were represented in the mounted specimen and were seen projecting through the skin which clothed the "ossicone" up to a limit of about half-an-inch from the tip. From this level the dense bony matter was naked. It showed in each horn two fine transverse grooves, as in the ossicone examined and sliced by Dr. Forsyth Major. This went far to prove that the condition noted by him was not exceptional or morbid, and accordingly I have examined the ossicones of other specimens of adult male Okapis, as opportunity occurred. Several skins and imperfect skeletons have been received in London by dealers in zoological specimens, and I am especially indebted to Messrs. Rowland Ward & Co. for the opportunity of examining the ossicones of four adult Okapis. Of two of these individuals I have had the ossicones drawn (Pl. VI.) so as to show the free termination from different points of view. The two other specimens examined by me presented the same remarkable appearances as those figured, and as shown by the Paris Okapi, but I was unable to procure carefully drawn figures of them. Thus, including the Brussels skull examined by Dr. Forsyth Major, I have ascertained the existence of these transverse grooves or fissures in six adult male Okapis. I have

also evidence of their existence in a plaster cast of another specimen which passed through the hands of Messrs. Rowland Ward & Co.

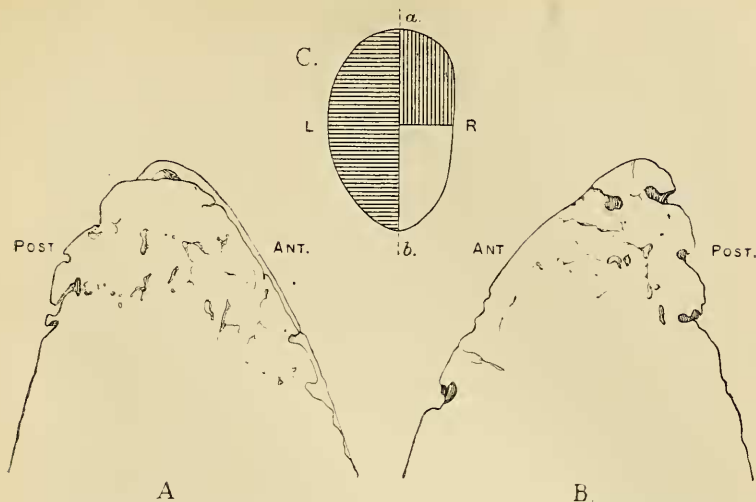
An examination of the figures given in Plate VI. shows that in all four ossicones (the right and left of two adult male Okapis) the free terminal region is smooth and polished, forming a cap of about half an inch in length, whilst this region is followed by a rougher substance, furrowed on the surface. The polished region projects beyond the skin, the rougher region is clothed by the living integument. In all there are very deep horizontal fissures in the polished material of the "cap." These fissures are somewhat irregular in form, and it is impossible without making a section (which I had not permission to do)* through the solid material to ascertain their depth. They are of the same nature as those shown in the text-figure in section (text-figure 49, p. 126).

I think there can be little doubt that these transverse fissures are caused by the ingrowth of the living tissue after the protrusion of the dense polished cap, so as to cut off the protruding portion and provide for its breaking off—just as an antler is cut off and prepared for disruption in the Cervidæ. A small conical piece is thus thrown off from the end of the horn or ossicusp, and may be regarded as a rudimentary or minute "antler."

But the process of discarding these minute points or antlers in the Okapi appears to differ from what occurs in the Cervidæ, not only in the minute size of the discarded segments, but in the fact that the preparation for the breaking off a second (and even a third) segment takes place before the first piece has been got rid of. The living tissue having absorbed the bony matter by a horizontal ingrowth and having created a transverse break in the continuity of the osseous substance (see text-figure), recedes for a distance of a sixth of an inch or less, and then again penetrates inwards, forming a new horizon of disruption; and from the appearance of the specimens figured in Plate VI., especially figs. 4 and 5, it seems that this process of the recession of the living investment of the horn-tip and the subsequent ingrowth of the living tissue, may be again repeated before the most anterior piece is broken off, so that these horizontal fissures are visible on the surface of the horn-tip, following one another somewhat irregularly.

* Since reading this paper, I have been kindly permitted by the authorities of the Royal Scottish Museum to examine the horns of one of the specimens above referred to by making a section of the tip of the horn. The piece cut out has been drawn and then carefully replaced and cemented in position, so that no injury is done to the specimen. The skull lent to me by the Royal Scottish Museum is that of which I had already drawn the horn-tips in figs. 1 to 8, Plate VI., before it had passed from the possession of Messrs. Rowland Ward & Co. The sections drawn on an enlarged scale in text-figs. 52 & 53 explain themselves. It is seen that the grooves or fissures visible on the surface do not extend very deeply, but that there is evidence of resorptive activity in the form of certain branching canal-like structures lying deeply within the bony matter, which have probably been excavated by resorptive ingrowths from the soft surface tissues.

Text-fig. 52.

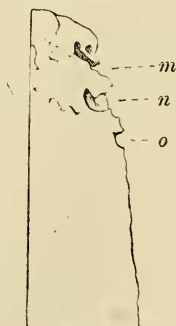


The diagram C shows the direction in which certain cuts have been made in the left osseous horn (ossicone or ossicusp) of the Edinburgh Okapi (also illustrated in Pl. VI. figs. 1 to 8).

a, anterior border; *b*, posterior border. L, left side; R, right side.

A is a drawing three times the natural size of the cut surface of the bisected horn, the bisection being effected in a plane erected on the line *ab* of the diagram C. It shows the eating in of the transverse fissures into the dense bony substance, and a number of irregular spaces and fissures which are probably cavities due to re-sorption of the bone. B is a drawing of the other half of the same bisected horn-tip.

Text-fig. 53.



Drawing of three times the natural size of the surface of a section obtained by cutting half of the same bisected horn-tip through a plane erected on the line R of the diagram, separating the shaded from the unshaded area. The penetration of the transverse fissures is shown. The cavities *m*, *n*, *o* correspond to the transverse fissures labelled *m*, *n*, *o* in fig. 5 of Plate VI., representing the same specimen before it was divided.